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61

HUGHES AIRCRAFT COMPANY

FULLERTON, CALIFORNIA

21 August 1961
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MONTHLY PROGRESS REPORT
ON THE
FEASIBILITY AND DESIGN STUDY FOR COLLECTIVE PROTECTION EQUIPMENT FOR THE AN/MSG-4 SYSTEM

CONTRACT NO.: DA 18-108 CML-6618

REPORT PERIOD: Technical Report, 1 July 1961 to 1 August 1961 (1st Month)
Financial Report, 1 July 1961 to 1 August 1961 (1st Month)

TO: Commanding Officer
U. S. Army Chemical Research and Development Laboratories

ATTENTION: Contract Project Officer
Army Chemical Center
Edgewood, Maryland

PURPOSE OF THE STUDY

The purpose of this study is to evaluate the feasibility of installing collective protection (air filtration) equipment on semitrailer vans, trucks, and air transportable shelters that contain the various subsystems of the AN/MSG-4 Antiaircraft Defense System. The collective protection equipment will include: a chemical, bacteriological, and radiological (CBR) filter for filtering irritating, noxious, and toxic gases and aerosols from the air; a pressure-control device to maintain minimum pressure of the air conditioning system; and an air lock that permits personnel to make safe entry and exit from the various vehicles and shelters. Mockups of proposed CBR filters and a mockup of a protective entrance will be fabricated following completion of the initial phase of the feasibility study. The activities during the month of of July are described on the following pages.

GENERAL INFORMATION AND PROBLEM AREAS

Representatives from Hughes visited the Army Chemical Center, Edgewood, Maryland on 11 July 1961 to obtain information concerning the basic design and types of material used in CBR filters previously developed at the Army Chemical Center. Data was obtained concerning design work on a CBR filter for the AN/MSQ-28 Operations Central. This filter was designed to operate at an air-flow rate of 400 cubic feet per minute.

The Army Chemical Center performed a feasibility study of collective protection equipment for the AN/MSG-4 system to aid in establishing air-leakage rates for this system. Hughes was provided with a technical memorandum, No. 32-52, on this study. It had been planned to use the data published in this memorandum to determine the required air-flow capacity of the CBR filters. However, examination of this memorandum revealed that the test methods used to measure the leakage rates did not necessarily provide a true indication of leakage that could occur within subsystems of the AN/MSG-4 under actual operating conditions. Since the air-flow capacity computations should be based on actual test data performed on deliverable subsystems, it is recommended that the existing contractual study be expanded to include additional pressure and leakage tests on the AN/MSG-4 subsystems.

DETAILED INFORMATION

During the first month the study effort was applied to the problems of filter installation; attachment and stowage of the collapsible, detachable protective entrance; scavenging air from the protective entrance; evaluating possible locations to introduce filtered air; and evaluating previously recorded data on pressure levels within the subsystems. Initial planning was completed on the time-phasing of the feasibility study in order to set guidelines for achieving contractual goals.

Possible attachment locations for the CBR filter have been investigated for all subsystems. Sketches of these locations have been made to permit a detailed study of possible configurations for the filter packages.

The semitrailer vans manufactured by Miller Trailers have Camloc receptacles installed around the trailer entrance that may be used for attachment of a protective entrance. The Camloc receptacles are attached to a 1/8-inch-thick by 1-1/2-inch-wide mounting strip that has been blind-riveted to the outside skin of the semitrailer. It is planned to propose Camlocs for attachment of the protective entrances to all AN/MSG-4 subsystems.

Because of the limited capacity of most air conditioners considered, it is proposed that the scavenging air supplied to the protective entrance would bypass the semitrailer, truck, or shelter compartment, and be delivered directly from the CBR filter to the protective entrance through an uninsulated-flexible duct to eliminate the requirement of cooling this air. This will also serve to reduce the pressure within the van and thereby reduce the leakage rate.

The Model CE 60-C-60 air conditioner used for the production AN/MSQ-28 system is the only air conditioner used in AN/MSG-4 equipment that contains inlet mounting provisions for a CBR filter. It is planned to mount the CBR filters on the CE 60-C-60 air conditioners at the locations provided. All other air conditioners for the AN/MSG-4 subsystems are equipped with a combination fresh air damper and exhaust air damper mounted in the mixing chamber of the air conditioners. This damper is automatically positioned to seek a minimum fresh-air inlet and exhaust-air outlet position to limit the volume of fresh air admitted to the air conditioner during operation. Because of the damper motion, it is not feasible to provide an adapter for attaching a CBR filter at the fresh air inlet of the mixing chamber. Major rework would be required in the air conditioner to provide an inlet for filtered air at any other point. Because of this, it is planned to close the fresh-air inlet and admit filtered air into the return-air plenum of the AN/MSQ-18 trucks and the research and development AN/MSQ-28 semitrailers, and through an adapter into the return air duct of the AN/TSQ-38 shelters. When filtered air is admitted into the return-air plenum, the pressure level against which the filtered air must be delivered is slightly greater than if the filtered air is admitted into the mixing chamber of the air conditioner. Since the walls and floor of the research and development AN/MSQ-28 and all AN/MSQ-18 trucks form a part of the return-air plenum, a connector for filtered air may be inserted from the outside of the vehicles, through a bulkhead, and into the return air plenum to provide an inlet for filtered air. The CBR filters will then be mounted on the outside of the vehicles. This method of mounting will simplify design and will allow easy installation, maintenance and replacement.

The pressure levels within individual shelters and their air conditioning systems vary greatly due to inherent characteristics of the air conditioning systems, such as the static pressure against which the air conditioner fans must operate and the pressure losses throughout various portions of the air conditioning systems. Data from pressure tests previously conducted by Hughes is shown in Table I. Tests on the AN/TSQ-38 Operations Central (OC) and Coder-Decoder Groups (CDG's) and on the Weapons Monitoring Center (WMC) and the Radar Data Processing Center (RDPC) were conducted on wooden mockups of the semitrailers and shelters. Tests on the AN/MSQ-18 were conducted on a deliverable OC truck.

Table 1 Approximate Normal Operating Pressures in Inches, Water Gauge

	AN/TSQ-38 CDG & OC	AN/MSQ-28 WMC & RDPC	AN/MSQ-18 OC
Air conditioner discharge	1.38	1.36	0.50
Air conditioner return	0.13	0.12	0.22
Fan suction pressure	1.53	0.56	0.60
Equipment supply duct	0.67	1.12	0.34
Equipment return duct	0.09	0.00	0.10
Personnel supply duct	0.67	1.34	0.01
Shelter internal pressure	0.00	0.00	0.00

To prevent the entrance of any contaminants from outside air due to wind conditions, the minimum system pressure must not drop below 0.5 inch, water gauge. This means that air must be continually introduced into the vehicles to maintain a minimum of 0.5 inch, water gauge at the lowest pressure point in the system. The adjusted approximate operating pressures under these conditions are shown in Table 2. It is evident from this data that it will be difficult to maintain the pressure levels within the contractually specified levels of 0.5 to 1.5 inches, water gauge. Possible solutions for this problem are being studied.

Table 2 Approximate Adjusted Operating Pressures in Inches Water Gauge (System Pressurized)

	AN/TSQ-38 CDG & OC	AN/MSQ-28 WMC & RDPC	AN/MSQ-18 OC
Air conditioner discharge	3.41	2.42	1.60
Air conditioner return	1.90	0.94	0.88
Fan suction pressure	0.50	0.50	0.50
Equipment supply duct	2.70	2.18	1.44
Equipment return duct	1.94	1.06	1.00
Personnel supply duct	2.70	2.40	1.11
Shelter internal pressure	2.03	1.06	1.10

FINANCIAL SUMMARY

The funds expended, man hours expended, estimated costs for the next reporting month, and the balance of contract funds are shown in the following summary:

	July 1961		Cumulative thru July 1961		Estimated for August	
	Man Hours	Total Dollars	Man Hours	Total Dollars	Man Hours	Total Dollars
Expenditures*	74	$862.00	74	$862.00	668	$7457.00

Contract Cost Funds**	$46,025.00
Less Cumulative Costs	862.00
Balance Remaining	$45,163.00

*Expenditures shown are actual expenditures and include G & A.
**Contract cost funds are funds negotiated excluding fee.

PLANNED ACTIVITY FOR THE NEXT REPORTING MONTH

- Engineering will continue its efforts to determine: prospective CBR filter locations; a structural analysis of these locations; possible stowage compartments for protective entrances; configuration of protective entrances and their supporting members.
- It is anticipated that a representative of the Army Chemical Center will visit Hughes on 14 August for contractual coordination purposes.
- Study effort on establishing CBR filtration-unit air-flow rates will be confined to an analysis to determine the maximum filtering capacities that could be designed into filter assemblies of various sizes and configurations. If it is finally concluded that the 400 cfm rate is marginal or inadequate, this analysis will include a study of flow rates greater than 400 cfm.

HUGHES AIRCRAFT COMPANY
Ground Systems Group

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Project Manager
ADCP Production Program